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SOME NEW RADIOACTIVE ISOTOPES

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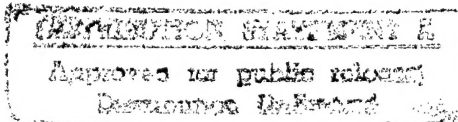
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Date of Manuscript: August 6, 1948
Date Declassified: September 21, 1948

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Technical Information Branch, Oak Ridge, Tennessee
AEC, Oak Ridge, Tenn., 2-9-49--850-A3562

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SOME NEW RADIOACTIVE ISOTOPEs

By Geoffrey Wilkinson and Harry G. Hicks

In order to allow quantitative interpretation of the reactions of high energy particles from the 184-inch cyclotron with tantalum and heavier elements, a systematic survey is being made of radioactive isotopes of the rare earth elements and hafnium, tantalum, tungsten and rhenium. Bombardments of various elements are being made using 38-Mev and 20-Mev helium ions, 19-Mev deuterons, and 10-Mev protons from the 60-inch Crocker Laboratory cyclotron. Chemical separation of the rare earth elements is made by ion-exchange resin columns. The accompanying table summarizes present data; energies of radiations are determined from absorption measurements; positrons are observed using a "magnetic counter"; mass allocations are made on the basis of measured cross sections.

Detailed accounts of experimental techniques and of the isotopes will be published.

The allocation of the previously reported β active isotopes of lutecium with half-lives of 3.75h and 6.8d, to masses 176 and 177 respectively, has been confirmed by measurement of the d,p cross sections for 19-Mev deuterons on lutecium.

Table 1.

Isotope	Class	Type of radiation	Half-life	Energy of particles	Radiation in Mev γ -Rays	Produced by
Tb ¹⁵²	D	K	4.5h		K,x-rays	Eu- α -3n
Tb ¹⁵³	D	K,e ⁻	5.1d	0.15, 0.4	L,K,x-rays	Eu- α -2n
Tb ¹⁵⁴	D	β^+ ,K,e ⁻ , γ	17.2h	β^+ 2.6 e ⁻ 0.22, ~1.4	L,K,x-rays 1.4	Eu- α -n Eu- α -3n
Tb ¹⁵⁵	D	K,e ⁻	~1y	0.1	L,K,x-rays	Eu- α -2n
Ho ¹⁶⁰	D	K?	~20m		x-rays	Tb- α -3n
Ho ¹⁶¹	B	K,e ⁻ , γ	4.5h	0.3	L,K,x-rays 1.1	Tb- α -2n Dy-p-n
Ho ¹⁶²	B	K,e ⁻ , γ	65d	0.16,0.6	L,K,x-rays	Tb- α -n Dy-d-n, 2n, 3n
Ho ¹⁶⁴	D	β^-	35m	0.7		Dy-p-n
Tm ¹⁶⁶	B	β^+ ,K,e ⁻ , γ	7.7h	β^+ , 2.1 e ⁻ 0.24, ~1	L,K,x-rays ~1.5	Ho- α -3n
Tm ¹⁶⁷	B	K,e ⁻ , γ	9d	0.21	L,K,x-rays 0.22, 0.95	Ho- α -2n Ta-d-5z-16a
Tm ¹⁶⁸	B	K?e ⁻	~150d			Ho- α -3n

Table 1. (continued)

Isotope	Class	Type of radiation	Half-life	Energy of particles	Radiation in Mev γ -Rays	Produced by
Lu ¹⁷⁰	B	β^+ , K, e^- , γ	2.15d	β^+ 1.7 e^- 0.1	L, K, x-rays 1.5	Tm- α -3n Yb-d-2n, 3n Ta-d-3z-13a
Lu ¹⁷¹	B	K, e^- , γ	9d	0.17, 0.7	L, K, x-rays	Tm- α -2n Ta-d-3z-12a Yb-d-n, 2n, 3n
Lu ¹⁷²	B	K, e^- , γ	> 100d			Tm- α -n Yb- α -n, 2n, 3n
Ta ¹⁷⁶	B	K, e^- , γ	8.0	0.12, 0.18, 1.2	L, K, x-rays 1.7	Lu- α -3n Ta-d-z-7a
Ta ¹⁷⁷	B	K, e^-	2.66d	0.1	L, K, x-rays	Lu- α -2n Ta-d-z-6a Hf-d-n, 2n, 3n
Ta ¹⁷⁹	B	K, e^- or β^-	16d	1.1		Lu- α -n Hf-d-n, 2n, 3n
Re ¹⁸²	B	K, e^- , γ	64h	0.11, 0.27 0.6	L, K, x-rays 0.22, 1.5	Ta- α -3n W-p-n
Re ¹⁸³ or 4 C	C	K, e^- , γ	~ 80d	0.1	L, K, x-rays 1.0	Ta- α -2n W-p-n
Re ¹⁸⁴ or 3 C	C	K, γ	13h		K, x-rays 1.6	Ta- α -n W-p-n

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